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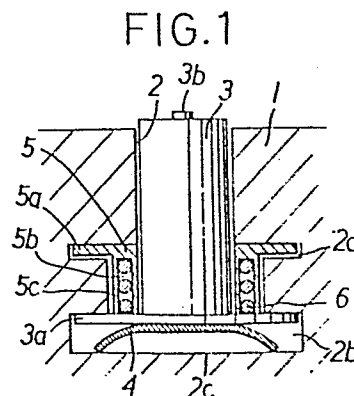
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(54) **SPIKED TIRE.**

(57) A spiked tire has pin holes (2) provided in the tread surface of a tire body (1). The interior of each pin hole (2) is provided with a spike pin (3) which can project from and withdraw into the pin hole (2), an urging means (4) which constantly urges the spike pin (3) in the direction in which the spike pin (3) projects from the pin hole (2), and an actuating member (6) of a shape memory alloy which is restored to its remembered shape, against the force of the urging means (4), by a rise in temperature of the tire resulting from the vehicle running on a road which is not icy or snowy, so that the spike pin (3) is able to withdraw into the tire body. The rise in temperature of a tire differs according to whether the vehicle is running on an icy or snowy road or on a road which is not icy or snowy. This difference in the rise of temperature of the tire is utilized so that the spike pins are automatically withdrawn into their pin holes by the restoration of the shape memory alloy to its remembered shape when the vehicle is running on a clear road preventing damage to the road surface by spiked tires and also the production of dust resulting therefrom.



## SPECIFICATION

TITLE OF THE INVENTION:

SPIKE TIRE

BACKGROUND OF THE INVENTION:Field of the Invention

5                   This invention relates to a spike tire to be used for securing safe travel of a vehicle on frozen and snowy roads.

Description of the Prior Art

10                   In snowy cold districts, tire chains and spike tires are used to drive motor vehicles safely on frozen and snowy roads. In this connection, lately there is a trend that in most cases the spike tires which have spikes or anti-skid elements constantly projected on the surface of a tire tread are preferred  
15                   to the chains which are fitted on tires only when road surfaces are frozen or snowed, because of the troubles of putting on and taking off the chains.

                  However, partly because of recent development of snow removing techniques and partly because of  
20                   increases in the amount of traffic, road surfaces are often exposed even after snowfalls, shortening the travel distances which need spike tires to a considerable degree. For instance, in Hokkaido, a northern district of Japan, it is assumed that the distance which requires

spike tires is as small as 5% of the total travel distance.

If used on such non-frozen, snow-free roads, the conventional spike tires which have hard metal spike pins embedded in the tread faces give rise to problems such as damages and abrasive wear of road surfaces and pollution by the resulting dust. These problems occur commonly in cold snowy districts of various countries, and are generally dealt with by totally prohibiting the use of spike tires or restricting the use to a certain period. However, from a view point of safe travel of vehicles in snowy districts, the use of spike tires is very effective, and therefore it is desirable to solve the above-mentioned problems in a way to permit the use of spike tires on non-frozen bare roads.

#### SUMMARY OF THE INVENTION:

It is an object of the present invention to provide a spike tire with spike pins which are automatically retractable into the tire on a non-frozen bare road according to a difference in temperature of the tire and spike pins on a frozen or snow-covered road and on a non-frozen bare road, thereby preventing the damages and abrasive wear of road surfaces as well as

the generation of pollutional dust.

According to the present invention, there is provided a spike tire which is characterized by the provision of: a spike pin retractably fitted in a pin  
5 receptacle hole on the surface of a tire tread; biasing means constantly urging the spike pins radially outward into a protruded position; and an actuating member of a shape memory alloy capable of restoring a memorized shape against the action of the biasing means  
10 upon a temperature increase by the heat generated in the tire as a result of operation on a non-frozen bare road thereby to retract the spike pin into the tire.

With the above-described spike tire according to the present invention, the actuating member of a  
15 shape memory alloy is retained in an easily deformable plastic state on a frozen or snow-covered road by a temperature drop, the biasing means urging spike pins to protrude from the pin receptacle holes to ensure safe travel of a vehicle. On the other hand, when a  
20 vehicle is cruising on a non-frozen bare road, the biasing force of the biasing means is overcome by the restoring force of the shape memory alloy of the actuating members and the spike pins are automatically retracted into the pin receptacle holes to prevent damages and  
25 abrasive wear of road surfaces by the spikes and the

resulting dust pollution.

The above and other objects, features and advantages of the invention will become apparent from the following description and appended claims, taken  
5 in conjunction with the accompanying drawings which show by way of example some preferred embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS:

In the accompanying drawings:

10       FIGURE 1 is a fragmentary sectional view of a spike tire according to the present invention;

FIGURE 2 is a view similar to FIGURE 1 but showing a spike in a different position;

15       FIGURE 3 is a fragmentary sectional view of a modification of the embodiment shown in FIGURE 1;

FIGURE 4 is a fragmentary sectional view of another embodiment of the invention;

FIGURE 5 is a view similar to FIGURE 4 but showing a spike in a different position;

20       FIGURE 6 is a fragmentary sectional view of a further embodiment of the invention;

FIGURE 7 is a view similar to FIGURE 6 but showing a spike in a different position;

FIGURE 8 is a fragmentary sectional view of

- 5 -

still another embodiment of the invention; and

FIGURE 9 is a view similar to FIGURE 8 but showing a spike in a different position.

DESCRIPTION OF PREFERRED EMBODIMENTS:

5           Referring to the accompanying drawings and first to FIGURES 1 and 2, there is shown a spike tire according to the present invention employing an actuating member consisting of a shape memory alloy of a coil form which is adapted to assume one of two different states  
10 of operation. Indicated at 1 is a tire proper and at 2 are pin receptacle holes provided on the tread surface of the tire 1, each pin receptacle hole 2 having large diameter portions 2a and 2b at its intermediate and bottom portions, respectively.

15           A spike pin 3 which is fitted in each receptacle hole 2 is provided with a flange portion 3a at its inner end to be fitted in the large diameter portion 2a of the receptacle hole 2, and its outer end is retractably protrudable from the receptacle hole 2. Interposed  
20 between the flange portion 3a of the spike pin 3 and a bottom surface 2c of the receptacle hole 2 is a dished spring 4 which serves as a biasing means for constantly urging the spike pin 3 to protrude out of the receptacle hole 2. The actuating member 6 of a shape memory alloy

of a coil form is interposed between the flange portion 3a of the spike pin and a stopper 5 which restricts the length of protrusion of the outer end portion 3b of the spike pin. The stopper 5 consists of a flange  
5 portion 5a to be fitted in the large diameter portion 2a of the receptacle hole 2 and a cylindrical portion 5c with an annular groove 5b for receiving therein the coil-like actuating member 6 of a shape memory alloy. Marginal edges at the inner open end of the annular  
10 groove 5b are abutted against the flange portion 3a of the spike pin to restrict the amount of its outward protrusion.

The shape memory actuating member 6 easily yields to an external force when in plastic state at  
15 temperatures below a transformation point at which the alloy restores a memorized shape. Namely, upon an increase in the temperature of the tire 1 or spike pin 3, the actuating member 6 which has been held in a deformed shape due to its plasticity restores a  
20 memorized shape, pushing the flange portion 3a of the spike pin toward the bottom surface 2c of the receptacle hole against the biasing force of the dished spring 4.

With regard to the shape memory alloy, there have been known various kinds of alloys of this sort  
25 and it is possible to set the temperature of restoration

of a memorized shape arbitrarily by varying the alloy composition. The transformation temperature of the actuating member 6 which is formed of such a shape memory alloy is determined depending upon the type of the vehicle or climate conditions of districts in which  
5 the tire is to be used.

When the spike tires of the above-described construction are running on a frozen or snow-covered road surface, each actuating member 6 of a shape memory alloy is held in an easily deformable plastic state  
10 as shown in FIGURE 1 due to a temperature drop, so that it is compressedly deformed by the biasing force of the dished spring 4. Accordingly, the flange portion 3a of the spike pin 3 is pushed radially outward by the  
15 dished spring 4 to hold the spike pin 3 in a protruded position on the tread surface of the tire 1.

On the other hand, when running on a non-frozen or snow-free road, the actuating member 6 of the shape memory alloy restores a memorized shape of a stretched  
20 coil as shown in FIGURE 2 due to a temperature increase caused by the heat resulting from the cruising operation. Consequently, the flange portion 3a of the spike pin 3 is pressed toward the bottom surface 2c of the receptacle hole 2 to retract the spike pin 3 into the hole 2.

25 FIGURE 3 illustrates a modification which



employs, instead of the actuating member 6 consisting of a coil-like shape memory alloy, an actuating member 16 of a dish-like shape memory alloy with a center aperture. In this figure, the actuating member 16 is  
5 shown in a restored state exhibiting a memorized concave shape. This actuating member 16 has an advantage that it contacts the flange portion 13a of the spike pin 13 over a broad area when plasticized and flattened by the biasing force of the dished spring 14, accelerating  
10 the heat transfer from the spike pin 13 to the actuating member 16 to ensure a quick action of the latter.

Although the dished spring 4 or 14 is interposed between the flange portion 3a or 13a of the spike pin 3 or 13 and the bottom surface 2c or 12c of the pin  
15 receptacle hole 2 or 12 in the foregoing embodiments, it is also possible to utilize a coil spring or the resilient restoring force of the tire rubber itself as the material of the tire 1 or 11. In the latter case, suitable resiliency can be obtained by providing a  
20 plural number of rubber projections on the bottom surface 2c or 12c of the pin receptacle hole.

Referring to FIGURES 4 and 5, there is shown another embodiment of the present invention with spike pins in protruded and retracted positions, respectively,  
25 in which indicated at 21 is a tire body proper and at

22 are pin receptacle holes which are provided on the tread surface of the tire 21, each pin receptacle holes 22 being internally provided with a large diameter portion 22a.

5                Fitted in the pin receptacle hole 22 is a spike pin 23 having an internal guide hole 23a open at the inner end thereof and an outer end portion 23b which is retractable into the pin receptacle hole 22. A shank portion 24a of guide pin 24 which supports  
10                and guides the spike pin 23 is fitted in the internal guide hole 23a. The spike pin 23 and guide pin 24 are provided with flanges 25 and 26, respectively, which are opposingly received in the large diameter portion  
15                22a of the pin receptacle hole 22. These flanges 25 and 26 are formed with opposing flat support surfaces 25a and 26a and tapered guide surfaces 25b and 26b which are diverged in V-shape around the support surfaces 25a and 26a.

                 Provided between the flanges 25 and 26 are a  
20                ring-like actuating member 27 of a shape memory alloy which is expansible to a memorized shape, i.e., a ring of an increased diameter which lies on the outer side of the support surfaces 25a and 26a (FIGURE 5), and a spiral spring 28 which compressingly deforms and  
25                forcibly pushes the actuating member 27 into a position

between the flat support surfaces 25a and 26a to protrude the spike pin 23 radially outward as soon as the actuating member 27 is plasticized.

5 The large diameter portion 22a of the receptacle hole 22 is spread in the axial direction of the spike pin by the flanges 25 and 26 against the resilient restoring force of rubber of the tire 1 itself as shown in FIGURE 4 when the actuating member 27 is pushed inbetween the support surfaces 25a and 26a by the biasing force  
10 of the spring 28. Accordingly, when the actuating member 27 comes off the support surfaces 25a and 26a by restoration of the memorized shape as shown in FIGURE 5, the resilient restoring force of the tire rubber acts on the flange 25 of the spike pin 23 to retract the same  
15 into the pin receptacle hole 22.

When the spike tires of the above-described construction are running on a frozen or snow-covered road, the shape memory alloy of the actuating member 27 is cooled into plastic state and compressedly deformed  
20 by the biasing force of the spring 28 as shown in FIGURE 4, setting apart the flanges 25 and 26 against the resilient restoring force of the tire 1 and pushing in the actuating member 27 between the support surfaces 25a and 26a to retain the spike pin 23 in the protruded  
25 position. On the other hand, when running on a non-frozen

or snow-free road, the temperature of the actuating member 27 is raised by the heat which is generated in the running tire, so that the actuating member 27 restores by itself the memorized shape of a larger diameter, disengaging from the support surfaces 25a and 26a as shown in FIGURE 5. Consequently, the spike pin 23 is retracted into the receptacle hole 22 by the resilient restoring force of the tire 1 proper.

The sectional shape of the actuating member 27 is not limited to the circular shape shown, and may be formed in any other shape which is suitable for the above-described operation. Further, the spring 28 may be a coil spring, a leaf spring, a spiral spring or the like.

In this manner, the spike pin 23 is retained in the protruded state by pushing in the actuating member 27 of a shape memory alloy between the support surfaces 25a and 26a on the flanges 25 and 26 of the spike pin 23 and guide pin 24 securely even under a large load of a vehicle.

FIGURES 6 and 7 shows another embodiment of the invention, in which indicated at 31 is a tire proper and at 32 is a pin receptacle hole which is formed on the tread surface of the tire 1 and internally provided with a large diameter portion 32a.

Fitted in the pin receptacle hole 32 is a

spike pin 33 having an internal bore 33a formed axially from the inner end thereof and an outer end portion 33b retractably protruded from the pin receptacle hole 32. The spike pin 33 is supported and guided by a guide pin 34 with a shank portion 34a fitted in the guide hole 33a. The spike pin 33 and guide pin 34 are provided with flanges 33c and 34b at the respective base ends, the flanges 33c and 34b being opposingly received in the large diameter portion 32a of the pin receptacle hole 32.

10           The shank 34a of the guide pin 34 is extended through a center aperture of a dished spring 35 which is interposed between the flange portions 33c and 34b to apply a biasing force on the spike pin 33 in a protruding direction. The biasing means which is  
15           constituted by the dished spring 35 may be replaced by a resilient member of a different type such as a leaf spring or a coil spring if desired.

          The outer end 33b of the spike pin 33 is connected to the outer end of the shank portion 34a of  
20           the guide pin by a meandering or coiled actuating member 36 of a shape memory alloy. Part of the shape memory alloy is exposed to the outside at the outer end of the spike pin 33.

          When the spike tires of the foregoing construction are running on a frozen or snow-covered road, the  
25

shape memory alloy of the actuating member 36 is cooled into plastic state so that the spike pin 33 is protruded from the surface of the tire 1 by the biasing force of the spring 35 as shown particularly in FIGURE 6.

5           On the other hand, on a non-frozen or snow-free road, the shape memory alloy of the actuating member 36 is warmed by the heat which is generated in the tire as a result of the running operation of the vehicle, contracting into a memorized shape of a shorter length  
10 as shown in FIGURE 7. Consequently, the spring 35 is compressed flat and the spike pin 33 is retracted into the pin receptacle hole 32 from the surface of the tire 1.

          In this embodiment, the actuating member 36 is mounted in position in such a manner that part of the  
15 shape memory alloy is exposed on the surface at the outer end 33b of the spike pin 33, so that the heat transfer from a road surface to the actuating member can be accelerated to ensure a quick response to variations in the road condition.

20           FIGURES 8 and 9 show still another embodiment of the invention, in which denoted at 41 is a tire proper and at 42 a pin receptacle hole which is provided on a tread surface of the tire 41. The pin receptacle hole 42 is provided with a large diameter portion 42a  
25 at the inner end thereof, and a notch 42b around its

bottom surface 42c to facilitate elastic deformation of the tire rubber. Fitted in the pin receptacle hole 42 is a spike pin 43 having a flange portion 43a at its base or inner end opposite a retractably protruded outer end portion 43b. A resilient member 44 is interposed between the flange portion 43a and the bottom surface 42c of the pin receptacle hole 42 to urge the spike pin 43 radially outward. The resilient member 44 which constitutes a biasing means may be substituted by a rubber strip, dished spring, ring spring, resilient synthetic resin material or the like. Further, interposed between the flange portion 43a of the spike pin 43 and a stopper plate 45 fitted in abutting engagement with a stepped wall at the outer end of the large diameter portion of the pin receptacle hole 42 is an actuating member 46 consisting of a plural number of overlapped shape memory alloy members with a suitable memorized shape for setting apart the flange 43a and stopper plate 45.

The stopper plate 45 serves for increasing the contact area between the tire 41 and actuating member 46 and is in the form of a ring having a center aperture fitted on the spike pin 43. The shape memory alloy members 46 are formed in the shape of a coil having one or more helics and used in overlapped state

to provide a compact construction with a doubled stress.

When running on a frozen or snow-covered road, the shape memory alloy of the actuating member 46 is cooled into plastic state and compressedly deformed by the action of the resilient member 44 to maintain the spike pin 43 in the protruded position as shown in FIGURE 8. On the other hand, on a non-frozen or snow-free road, the shape memory alloy of the actuating member 46 is warmed by the heat which is generated in the rolling tire and restores the memorized shape as shown in FIGURE 9, pressing the flange portion 43a of the spike pin 43 radially inward against the action of the resilient member 44 and the air pressure of the tire tube. As a result, the outer end portion 43b of the spike pin 43 is retracted into the pin receptacle hole 42 under the surface 42c of the tire 41. The notch 42b which is provided around the bottom surface 42c of the pin receptacle hole 42 facilitates the elastic deformation of the tire rubber.

The above-described retractable spike pin arrangement using an actuating member consisting of a number of coil-like wires with one or more helices permits to reduce the diameters of the wire and coil to obtain a given restoring force as compared with a case using a single coil spring for the actuating



member, coupled with improvements in resistance to strain and fatigue. Accordingly, it becomes possible to obtain a spike tire which is smaller in size and which can endure hard frictions and vibrations. It follows that a large number of spike pins can be driven into the surface of a tire to enhance braking characteristics on ice and snow.

With the spike tires of the above-described embodiments, it is necessary to protrude the spike pins rigidly from the tread surface of the tire when running on a frozen or snow-covered road, by a length sufficient for the spike pins to penetrate a frozen or snowed road surface. However, on a non-frozen or snow-free road, the spike pins are not necessarily required to be completely retracted into the pin receptacle holes. The object of the invention can also be attained by spike pins which are arranged to retract into the tire when depressed with a relatively weak force.

Tables 1 and 2 below show the results of experiments conducted by the inventor, in which the spike pins of the construction shown in FIGURES 8 and 9 were attached to automobile tires of a pneumatic pressure of  $1.8 \text{ kg/cm}^2$  with a force of protrusion of 20 kg and actually run on roads of various conditions. In these tables, the length of pin protrusion is indicated by

way of a measure from the tire tread surface, the figures with positive and negative marks "+" and "-" showing the extents of protrusion and retraction from the outer surface of the tire tread, respectively.

Table 1

Testing time (min)	0	0-5	5	5-20	20	20-25	25	25-40	40
Temp. (°C) Cloudy	1		1		1		1		1
Road surface condition		Pressed snow		Pressed snow		Paved		Paved	
Road surface temp. (°C)		0		0		1		1	
Vehicle speed (km/hr)		60		60		60		60	
Temp. in tire tread (°C)	3		10		12		20		30
Temp. around s. pin (°C )	2		6		8		23		32
Protrusion length (mm)	+1.5		+1.5		+1.5		+0.5		-0.1

Table 2

Testing time (min)	0	0-30	30	30-35	35	35-40	40
Temp. (°C) Cloudy	1		1		1		1
Road surface condition		Paved		Pressed snow		Pressed snow	
Road surface temp. (°C)	1	1		0		0	
Vehicle speed (km/hr)		60		60		60	
Temp. in tire tread (°C)	5		31		20		18
Temp. around s. pin (°C)	3		33		16		11
Protrusion length (mm)	+1.5		-0.1		+1.2		+1.5

WHAT IS CLAIMED IS:

1           1. A spike tire for a vehicle, comprising:  
2           a pin receptacle hole provided on the tread  
3           surface of said tire;  
4           a spike pin retractably protrudable from  
5           said pin receptacle hole;  
6           a biasing means constantly urging said spike  
7           pin to protrude from said pin receptacle hole; and  
8           an actuating member of a shape memory alloy  
9           capable of restoring a memorized shape when warmed  
10          to a predetermined temperature by the heat generated  
11          in said tire as a result of operation of said vehicle  
12          on a non-frozen or snow-free road surface, thereby to  
13          retract said spike pin into said tire against the  
14          action of said biasing means.

1           2. A spike tire as set forth in claim 1,  
2           wherein said biasing means for constantly urging said  
3           spike pin in a protruding direction is constituted  
4           by a dished spring.

1           3. A spike tire as set forth in claim 1,  
2           wherein said biasing means is constituted by a coil  
3           spring.

1           4. A spike tire as set forth in claim 1,  
2 wherein said biasing means utilizes resilient force of  
3 the tire material.

1           5. A spike tire as set forth in any one of  
2 claims 1 to 4, wherein said actuating member is  
3 constituted by a shape memory alloy of a coil-like  
4 form.

1           6. A spike tire as set forth in any one of  
2 claims 1 to 4, wherein said actuating member is cons-  
3 tituted by a shape memory alloy of a dished form.

1           7. A spike tire as set forth in claim 1,  
2 further comprising a guide pin fitted in said pin  
3 receptacle hole for supporting and guiding said spike  
4 pin, flanges provided on said spike and guide pins,  
5 and flat support surfaces formed opposingly said flanges,  
6 said biasing means constantly urging said actuating  
7 member of a shape memory alloy into a position between  
8 said flat support surfaces, and said actuating member  
9 disengaging from said support surfaces upon restoration  
10 of a memorized shape.

1           8. A spike tire as set forth in claim 1,  
2 further comprising a guide pin fitted in said pin  
3 receptacle hole for supporting and guiding said spike  
4 pin, said biasing means being located between said  
5 spike and guide pins for urging said spike pin in a  
6 protruding direction, and said guide pin being  
7 connected to said spike pin by said actuating member  
8 of a shape memory alloy.

1           9. A spike tire as set forth in claim 8,  
2 wherein an end portion of said actuating member of a  
3 shape memory alloy is exposed at said outer end of  
4 said spike pin.

1           10. A spike tire as set forth in claim 1,  
2 wherein said actuating member is constituted by a  
3 plural number of overlapped segments of a shape memory  
4 alloy.

## AMENDMENT of CLAIMS under Article 19

1. A spike tire for a vehicle, comprising:
  - a pin receptacle hole provided on the tread surface of said tire and having a notch around bottom surface thereof;
  - a spike pin retractably protrudable from said pin receptacle hole;
  - a biasing means constantly urging said spike pin to protrude from said pin receptacle hole by means of resilient restoring force of the tire rubber itself; and
  - an actuating member of a shape memory alloy capable of restoring a memorized shape when warmed to a predetermined temperature by the heat generated in said tire as a result of operation of said vehicle on a non-frozen or snow-free road surface, thereby to retract said spike pin into said tire against the action of said biasing means.
2. A spike tire as set forth in claim 1, wherein said actuating member is constituted by a shape memory alloy of a coil-like form.
3. A spike tire as set forth in claim 2, wherein said actuating member is constituted by a plural number of overlapped segments of a shape memory.
4. A spike tire as set forth in claim 1 to 3, wherein said biasing means utilizes a resilient member interposed between the spike pin and the pin receptacle hole in addition to said resilient restoring force of the tire rubber itself.

## BRIEF STATEMENT

1. New Claim 1 is amended the original claim 1 in order to restrict that the pin receptacle hole is provided with a notch around bottom surface thereof and resilient restoring force of the tire rubber itself is used as the biasing means constantly urging the spike pin to protrude from the pin receptacle hole.
2. Claim 2 corresponds to original claim 5.
3. Claim 3 corresponds to original claim 10.
4. New Claim 4 is amended the original claim 1 with the intention to restrict that the pin receptacle hole is provided with a notch around bottom surface thereof and a resilient member interposed between the spike pin and the pin receptacle hole and the resilient restoring force of the tire rubber itself are used as the biasing means constantly urging the spike pin to protrude from said pin receptacle hole.
5. The original claims 2 to 3 and 6 to 9 are cancelled by the amendment of claim 1.



FIG.1

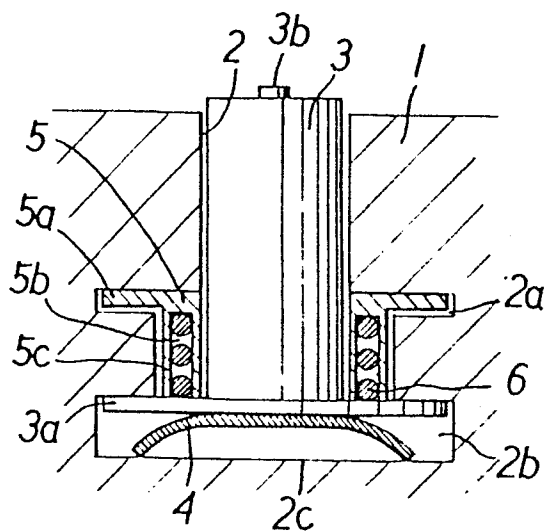


FIG.2

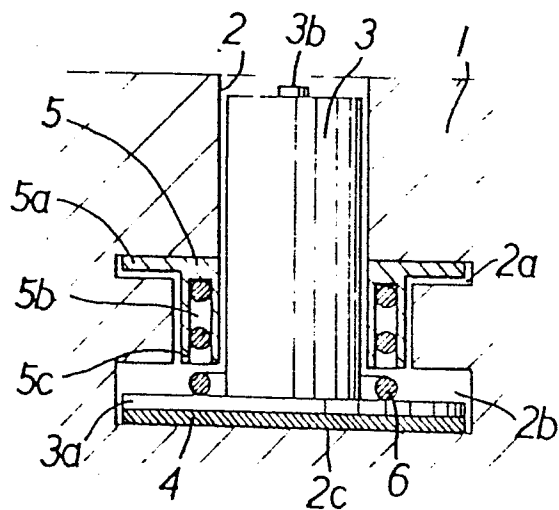


FIG.3

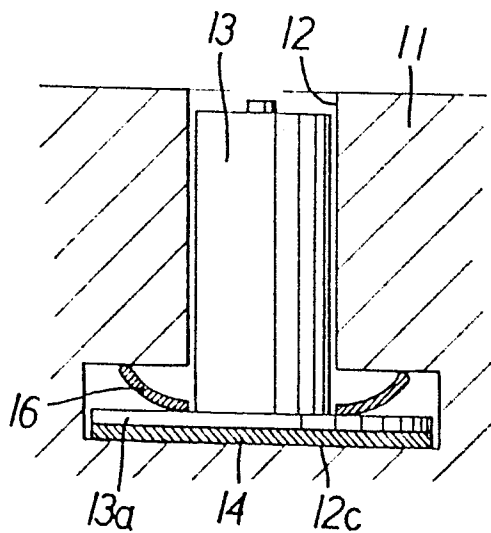


FIG.4 0129604

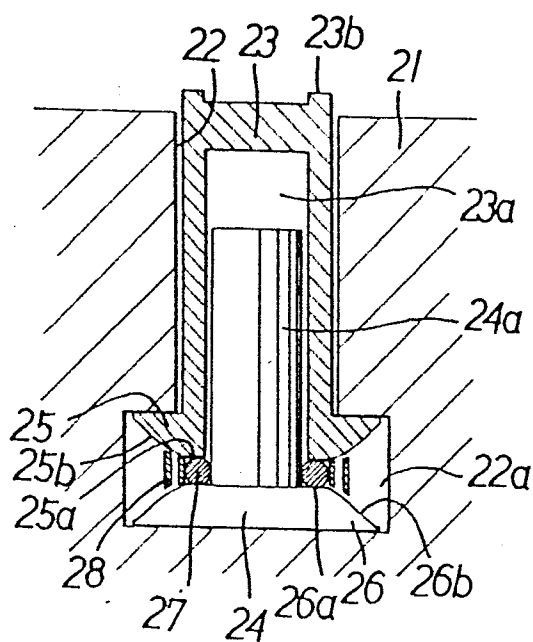


FIG.5

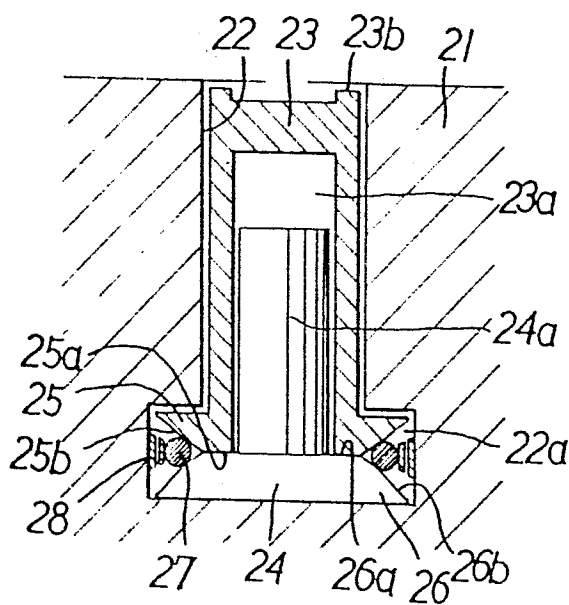


FIG. 6

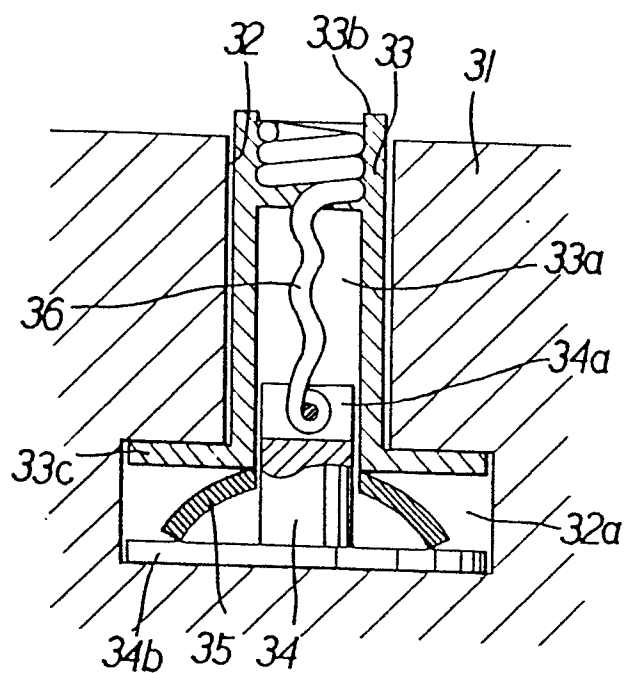


FIG. 8

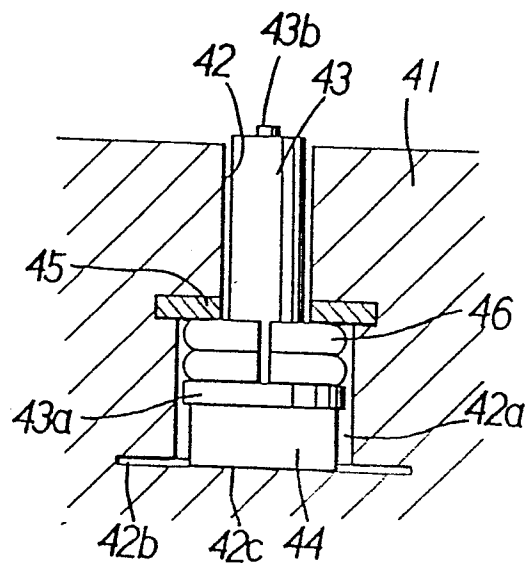


FIG. 7

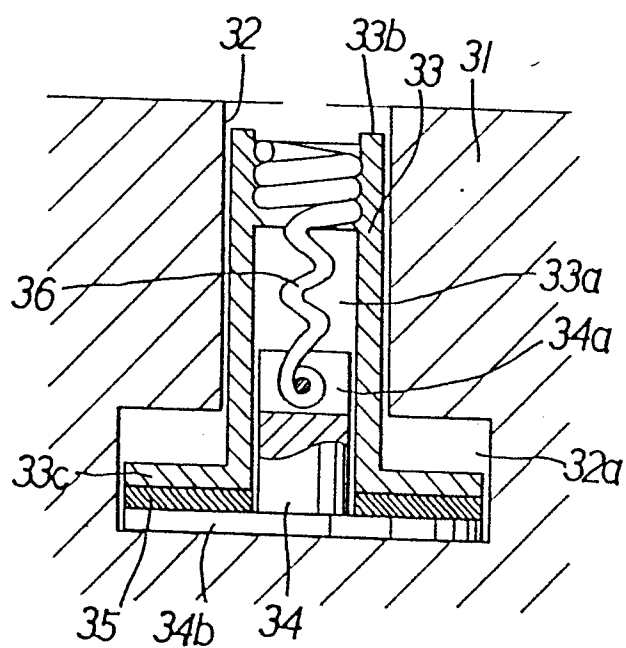
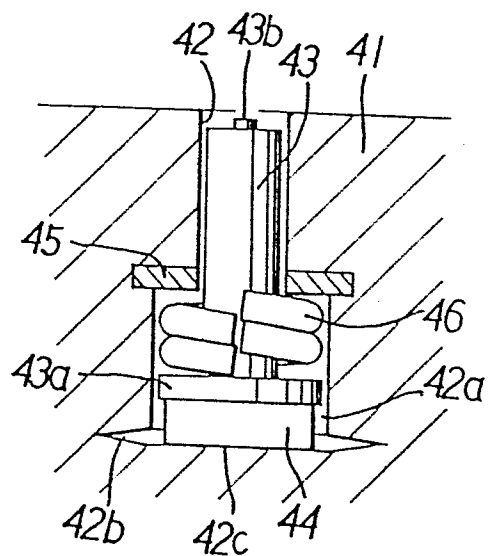


FIG. 9



List of reference numerals  
and the corresponding components

Reference numerals	Components	Reference numerals	Components
1 .....	Tire proper	21 .....	Tire proper
2 .....	Pin receptacle hole	22 .....	Pin receptacle hole
2a ....	Large diameter portion	22a ....	Large diameter portion
2b ....	Large diameter portion	23 .....	Spike pin
2c ....	Bottom surface	23a ....	Guide hole
3 .....	Spike pin	23b ....	Outer end portion
3a ....	Flange portion	24 .....	Guide pin
3b ....	Outer end portion	24a ....	Shank portion
4 .....	Spring	25 .....	Flange
5 .....	Stoper	25a ....	Support surface
5a ....	Flange portion	25b ....	Guide surface
5b ....	Annular groove	26 .....	Flange
5c ....	Cylindrical portion	26a ....	Support surface
6 .....	Actuating member	26b ....	Guide surface
11 ....	Tire proper	27 .....	Actuating member
12 ....	Pin receptacle hole	28 .....	Spring
12c ...	Bottom surface	31 .....	Tire proper
13 ....	Spike pin	32 .....	Pin receptable hole
13a ...	Flange portion	32a ....	Large diameter portion
14 ....	Spring	33 .....	Spike pin
16 ....	Actuating member		

Reference numerals	Components
33a ....	Internal bore
33b ....	Outer end portion
33c ....	Flange
34 ....	Guide pin
34a ....	Shank portion
34b ....	Flange
35 ....	Spring
36 ....	Actuating member
41 ....	Tire proper
42 ....	Pin receptacle hole
42a ....	Large diameter portion
42b ....	Notch
42c ....	Bottom surface
43 ....	Spike pin
43a ....	Flange portion
43b ....	Outer end portion
44 ....	Resilient member
45 ....	Sropper plate
46 ....	Actuating member

## INTERNATIONAL SEARCH REPORT

0129604

International Application No.

PCT/JP83/00443

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>3</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int. Cl <sup>3</sup> B60C11/16		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>4</sup>		
Classification System	Classification Symbols	
IPC	B60C11/16	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>4</sup>		
	Jitsuyo Shinan Koho	1939 - 1983
	Kokai Jitsuyo Shinan Koho	1971 - 1983
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup>		
Category <sup>15</sup>	Citation of Document, <sup>16</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
Y	JP, U, 56-158304 (Yokoo Seisakusho Kabushiki Kaisha) 26 November 1981 (26. 11. 81) Column 1, lines 2 to 8	1, 3
Y	US, A, 3,095,918 (John G. Mike) 2 July 1963 (2. 7. 63) Column 3, lines 25 to 31	1, 3
Y	JP, U, 56-158304 (Yokoo Seisakusho Kabushiki Kaisha) 26 November 1981 (26. 11. 81) Column 1, lines 2 to 8	4
Y	US, A, 3,831,655 (Kennametal Luc) 27 August 1974 (27. 8. 74) Column 4, lines 63 to 68	4
P	JP, A, 58-112809 (Gotsuka Kazuhiro) 5 July 1983 (5. 7. 83) Column 1, lines 6 to 14	1, 2, 5
<p><sup>15</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search <sup>1</sup>		Date of Mailing of this International Search Report <sup>2</sup>
March 21, 1984 (21. 03. 1984)		March 26, 1984 (26. 03. 84)
International Searching Authority <sup>1</sup>		Signature of Authorized Officer <sup>20</sup>
Japanese Patent Office		